

Appl. No. 10/600,484  
Amdt. dated June 20, 2005  
Reply to Office Action of : Examiner Request 6/16/2005

PATENT

**Amendments to the Claims:**

This listing of claims will replace all prior versions, and listings of claims in the application:

**Listing of Claims:**

1-26. (canceled).

27. (currently amended) A method of generating an output symbol, wherein the output symbol is selected from an output alphabet and the output symbol is such that an input file, comprising an ordered plurality of input symbols each selected from an input alphabet, is recoverable from a set of such output symbols, the method comprising:

calculating, according to a predetermined function, a list AL for each output symbol to be output, wherein AL is an indication of weights W associated input symbols associated with the output symbol to be output, and wherein the weights W are positive integers that vary between at least two values and are greater than one for at least one list; and generating an output symbol value B from a predetermined function of the associated input symbols indicated by AL for each output symbol to be output;

wherein the ~~ratio of the~~ number of possible output symbols to be output is effectively unbounded such that the number of output symbols available given any expected signal to noise ratio can be larger than ~~to the~~ number of input symbols in the plurality of input symbols ~~is greater than is needed for any expected signal to noise ratio.~~

28. (previously presented) The method of claim 27, further comprising: obtaining a key I for each output symbol to be output, wherein I is unique for each output symbol to be output and the number of possible keys is much larger than the number of input symbols in the input file; and wherein AL, W and B are calculated using I as an input.

29. (previously presented) The method of claim 28, wherein obtaining key I comprises calculating key I according to a random function or pseudorandom function.

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30. (previously presented) The method of claim 28, wherein calculating comprises calculating  $W(I)$  according to a random function or pseudorandom function of  $I$ .

31. (previously presented) The method of claim 28, wherein calculating comprises calculating  $AL(I)$  according to a random function or pseudorandom function of  $I$ .

32. (previously presented) The method of claim 28, wherein each subsequent key  $I$  is one greater than the preceding key.

33. (previously presented) The method of claim 28, wherein calculating comprises:  
calculating, according to a predetermined function of  $I$  and a probability distribution, a weight  $W(I)$ , wherein the probability distribution is over at least two positive integers, at least one of which is greater than one;  
calculating a list entry for list  $AL(I)$ ; and  
repeating the step of calculating a list entry for list  $AL(I)$  until  $W(I)$  list entries are calculated.

34. (previously presented) The method of claim 33, wherein calculating  $W(I)$  comprises determining  $W(I)$  such that  $W$  approximates a predetermined distribution over the key alphabet.

35. (previously presented) The method of claim 34, wherein the predetermined distribution is a uniform distribution.

36. (previously presented) The method of claim 34, wherein the predetermined distribution is a bell curve distribution.

37. (previously presented) The method of claim 34, wherein the predetermined distribution is such that  $W=1$  has a probability of  $1/K$ , where  $K$  is the number of input symbols in the input file, and  $W=i$  has a probability of  $1/i(i-1)$  for  $i=2, \dots, K$ .

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38. (previously presented) The method of claim 34, wherein the predetermined distribution is such that, given tunable parameters  $R1$  and  $R2$  and  $K$  being the number of input symbols in the input file, weight  $W=1$  has a probability proportional to  $R1/K$ , weights in a low-weight class ranging from weight  $W=2$  to weight  $W=K/R2 - 1$  have a probability proportional to  $1/(W(W-1)(1-W \cdot R2/K))$  and weights in a high-weight class ranging from weight  $W=K/R2$  to weight  $W=K$  have a selected probability distribution.

39. (previously presented) The method of claim 27, wherein the predetermined function of the associated input symbols indicated by  $AL$  is an exclusive OR (XOR) of the input symbols indicated by  $AL$ .

40. (previously presented) The method of claim 27, wherein the input alphabet and the output alphabet are the same alphabet.

41. (previously presented) The method of claim 27, wherein the input alphabet comprises  $2^{M_i}$  symbols and each input symbol encodes  $M_i$  bits and wherein the output alphabet comprises  $2^{M_o}$  symbols and each output symbol encodes  $M_o$  bits.

42. (previously presented) The method of claim 27, wherein calculating  $AL$  comprises:

identifying the number  $K$  of input symbols in the input file, at least approximately and a weight  $W$ ;

determining the smallest prime number  $P$  greater than or equal to  $K$ ;

if  $P$  is greater than  $K$ , at least logically padding the input file with  $P-K$  padding input symbols;

generating a first integer  $X$  such that  $1 \leq X < P$  and a second integer  $Y$  such that  $0 \leq Y < P$ ;

setting the  $J$ -th entry in  $AL$  to  $((Y + (J-1) \cdot X) \bmod P)$  for each  $J$  from 1 to  $W$ .

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43. (previously presented) The method of claim 42, wherein setting the J-th entry in AL for each J comprises:

setting the first entry  $V[J=0]$  in an array V to Y;  
setting the J-th entry  $V[J]$  in the array V to  $(V[J-1] + X) \bmod P$  for each J from 1 to W minus one; and  
using the array V as the list AL.

44. (currently amended) ~~A The method of encoding a plurality of output symbols, each according to claim 27, the method~~ further comprising:

repeating steps for generating a plurality output symbols;  
generating a key I for each of the output symbols to be generated; and  
outputting each of the generated output symbols as an output sequence to be transmitted through a data erasure channel.

45. (previously presented) The method of claim 44, wherein each key I is selected independently of other selected keys.

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46. (currently amended) A method of generating an output symbol, wherein the output symbol is selected from an output alphabet and the output symbol is such that an input file, comprising an ordered plurality of input symbols each selected from an input alphabet, is recoverable from a set of such output symbols, the method comprising:

calculating, according to a predetermined function, a list AL for each output symbol to be

output, wherein AL is an indication of weights W associated input symbols associated

with the output symbol to be output, and wherein the weights W are positive integers

that vary between at least two values and are greater than one for at least one list; and

generating an output symbol value B from a predetermined function of the associated input

symbols indicated by AL for each output symbol to be output; wherein the ~~ratio of the~~

number of possible output symbols is effectively unbounded such that the number of

output symbols available given any expected loss rate of a communication medium can

be greater than ~~to be output to~~ the number of input symbols in the plurality of input

symbols ~~is greater than is needed for any expected loss rate of a communications~~

~~medium.~~